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TITLE: LOS ALAMOS UPGRADE IN METALLOGRAPHIC CAPABILITIES

AUTHOR(S): James M. Ledbetter, Keith E. Dowler and Jay H. Cook

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Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Los Alamos Upgrade

in

Metallographic Capabilities

J. M. Ledbetter, K. E. Dowler and J. H. Cook

Introduction

The Los Alamos Wing 9 Hot Cell Facility is in the process of upgrading their metallographic sample preparation and examination capability. The present capability to grind, polish and etch samples from reactor fuels and materials has been in operation for 18 years. Macro photography and alpha and beta-gamma autoradiography are an important part of this capability. Some of the fast breeder reactor experiments have contained sodium as a coolant. Therefore, the capability to distill sodium from some samples scheduled for microstructural examinations is a requirement. Since the reactor fuel samples are highly radioactive and contain plutonium, either as fabricated or as a result of breeding during reactor service, these samples must be must be handled in shielded hot cells containing alpha boxes to isolate the plutonium and hazardous fission products from personnel and the environment. The present equipment that was designed and built into those alpha boxes has functioned very well for the past 18 years. During that time the technicians have thought of ways to improve the equipment to do the work faster and safer. These ideas and ideas that have been developed during the design of new alpha boxes and new equipment for microstructural sample preparation have provided the concepts for the capability to perform the work faster and maintain the equipment in a safer manner.

Upgraded Capabilities

The sodium distillation is provided by heating the samples containing the sodium in a vacuum and collecting the sodium on a cold trap surface. The newly designed sodium distillation system is compact and can accomodate up to six samples. The system reaches operating vacuum in about 15

minutes. The pressure and sample temperature are automatically controlled. Constant adjusting and/or monitoring of the system during operation are no longer required. The grinders and polishers are driven by drive motors mounted to the outside of the alpha box floor by a unique quick-disconnect system. The coupling of the drive motors to the grinders and polishers uses a ferrafluidic seal as as a passthrough through the alpha box floor. The grinders and polishers can be easily lifted off the drive coupling for removal or cleaning. The drive couplings are recessed in the floor so that if one of the grinders or polishers is not installed, a small cover is placed over the recess making the alpha box floor smooth and free of pertubations. The infloor drive system for the grinders and polishers is versatile and can be adapted to drive other devices requiring rotary motion.

Mock-up operations have shown that the drive motors for the grinders and polishers can be removed and replaced easily in less than one minute. Thus, maintenance or replacement, if necessary, is fast. The speed of the grinding and polishing motors is controlled by a speed controller with digital speed indicators. The accurate speed control contributes to precise sequential grinding. The drain pans used with the grinders and polishers are disposable. The pans are designed to be removed from the alpha box in the normal 7" waste transfer system. This design saves operator time during clean up. All components internal to the alpha boxes that may require repair or replacement are sized to fit in the 7" tranfer system for rapid repair.

Often a detailed examination of a sample is required during grinding. In the past, this examination has been possible only by transferring the sample to the metallograph. This process is disruptive and time consuming.

A new macro viewing-camera system has been designed and fabricated commercially . This viewing system allows samples to be inspected at magnification steps ranging from about 4x to 45x. This viewing system will save time and allow inspection of the samples when desired.

Innovations in Blister Design

A new blister has been designed that has the ability to accomodate two Leitz MM-5RT metallographs, thus, doubling the capacity to perform microstructural examinations. A new concept in metallograph-blister interface uses an inflatable gasket that seals the metallograph to the blister alpha box. Each metallograph is mounted permanently on a shielding cart that provides easy movement of the metallographs into and out of the blister and protects the critical alignment of the optical components of the metallograph. The shielding doors above the metallographs are raised and lowered with an integral hoist. With the shielding door raised, the metallograph can be removed from or installed in the blister in less than 10 minutes.

The metallographs have positive pressure inside the housing. The gas flow that results from the positive pressure helps keep the internal parts of the metallograph free of contamination. This minimizes decontamination prior to the maintenance on the metallographs.

In addition to the rapid removal and insertion of the metallographs, raising the shield doors provides immediate access to blister glove ports, the ion etcher, viewing windows and other parts of the blister.

A commercially available transfer system has been installed in the blister for transfer of autoradiography meterials in and out of the blister.